WHAT IS CLAIMED IS:

1. A computational image model, comprising:

an image support including a structure of n-pixels comprising pixel faces;

quantities related to image features; and

an algebraic structure relating the quantities to the n-pixels and/or pixel faces, the algebraic structure comprising algebraic operations defining a relation between the quantities.

2. A computational image model as defined in claim 1, wherein each n-pixel is defined as a geometrical structure comprising vertices, edges, faces and a volume, and wherein each n-pixel comprises:

a first pixel dimension n=0 including the vertices of the n-pixel;

a second pixel dimension n=1 including the edges of the n-pixel;

a third pixel dimension n=2 including the faces of the n-pixel;

a fourth pixel dimension n=3 including the volume of the n-pixel; and

a n^{th} pixel dimension n including the hypervolume of the n-pixel.

3. A computational image model as defined in claim 1, wherein the geometrical structure is selected from the group consisting of: a cube, a triangle, a hexagone and a pentagone.

4. A computational image model as defined in claim 1, wherein the quantities related to image features are selected from the group consisting of: scalar quantities, vectors, tensors and matrices.

5. A computational image model as defined in claim 1, wherein the algebraic operations comprise problem-independent operations.

6. A computational image model as defined in claim 1, wherein the algebraic operations comprise problem-dependent operations.

7. A computational image model as defined in claim 1, wherein the structure of n-pixels comprises pairs of disjoint n-pixels.

8. A computational image model as defined in claim 1, wherein the structure of n-pixels comprises pairs of n-pixels intersecting through a common i-pixel, where $i < n$.

9. A computational image model as defined in claim 1, wherein each n-pixel is translated algebraically into a q-pixel, wherein $q \in \{1, 2, \ldots, n\}$.

10. A computational image model as defined in claim 9, wherein each q-pixel includes (q-1)-faces, (q-2)-faces, ..., (q-q)-faces.

11. A computational image model as defined in claim 9, wherein the image support comprises a geometrical complex, which is a collection of q-pixels.

12. A computational image model as defined in claim 10, wherein the image support comprises a geometrical complex, which is a collection of q-pixels, and wherein:

- every face of a q-pixel in the geometrical complex is also located in the geometrical complex; and
- any pair of two q-pixels of the geometrical complex have an intersection which is either empty or constituted by a common face of both q-pixels of the pair.

13. A computational image model as defined in claim 11, comprising a plurality of image supports forming the geometrical complex.

14. A computational image model as defined in claim 11, wherein the geometrical complex is expressed in algebraic form as a q-chain, which is a linear combination of all the q-pixels of the geometrical complex.

15. A computational image model as defined in claim 9, wherein the geometrical complex comprises q-cochains, which are relations associating quantities related to image features to the q-pixels and/or faces of said q-pixels.

16. A computational image model as defined in claim 15, wherein the quantities related to image features and associated to the q-pixels and/or faces of said q-pixels are global quantities associated to all the q-pixels.

17. A computational image model as defined in claim 15, wherein the quantities related to image features and associated to the q-pixels and/or faces of said q-pixels are local quantities each associated to one q-pixel and/or faces of said one q-pixel.

18. A computational image model as defined in claim 16, comprising ($q \geq 1$)-cochains to represent the local quantities.

19. A computational image model as defined in claim 17, comprising 0-cochain to represent the global quantities.

20. A computational image model as defined in claim 17, wherein the algebraic operations comprise a coboundary operation giving a relationship between the q-cochains.

21. A computational image model as defined in claim 9, wherein:

the image support comprises a plurality of geometrical complexes, each being a collection of q-pixels; and

the algebraic operations comprise a codual operation establishing a link between q-cochains that belong to different geometrical complexes.

22. A method of computationally modelling an image, comprising:

producing an image support including a structure of n-pixels comprising pixel faces;

defining quantities related to image features; and

relating the quantities to the n-pixels and/or pixel faces through an algebraic structure, and relating the quantities to each other through algebraic operations.

23. A method of computationally modelling an image as defined in claim 22, wherein relating the quantities to the n-pixels and/or pixel faces through an algebraic structure comprises translating each n-pixel algebraically into a q-pixel, wherein $q \in \{1, 2,..., n\}$, wherein each q-pixel includes (q-1)-faces, (q-2)-faces, ..., (q-q)-faces.

24. A method of computationally modelling an image as defined in claim 22, wherein producing an image support comprises forming a geometrical complex, which is a collection of q-pixels, and wherein:

- every face of a q-pixel in the geometrical complex is also located in the geometrical complex; and
- any pair of two q-pixels of the geometrical complex have an intersection which is either empty or constituted by a common face of both q-pixels of the pair.

25. A method of computationally modelling an image as defined in claim 24, wherein producing an image support comprises forming a plurality of image supports forming the geometrical complex.

26. A method of computationally modelling an image as defined in claim 24, wherein relating the quantities to the n-pixels and/or pixel faces

through an algebraic structure comprises expressing the geometrical complex in algebraic form as a q-chain, which is a linear combination of all the q-pixels of the geometrical complex.

27. A method of computationally modelling an image as defined in claim 24, wherein relating the quantities to the n-pixels and/or pixel faces through an algebraic structure comprises forming, in the geometrical complex, q-cochains which are relations associating quantities related to image features to the q-pixels and/or faces of said q-pixels.

28. A method of computationally modelling an image as defined in claim 22, wherein defining quantities related to image features comprises defining global quantities associated to all the q-pixels.

29. A method of computationally modelling an image as defined in claim 22, wherein defining quantities related to image features comprises defining local quantities associated to one q-pixel and/or faces of said one q-pixel.

30. A method of computationally modelling an image as defined in claim 27, wherein relating the quantities to each other through algebraic operations comprise producing a coboundary operator giving a relationship between q-cochains.

31. A method of computationally modelling an image as defined in claim 27, wherein:

producing an image support comprises forming a plurality of geometrical complexes, each being a collection of q-pixels; and

relating the quantities to each other through algebraic operations comprises producing a codual operation establishing a link between cochains that belong to different geometrical complexes.

32. An image modelling method as defined in claim 27, wherein relating the quantities to the n-pixels and/or pixel faces through an algebraic structure comprises expressing a global quantity associated with all q-pixels through a q-cochain such that, for two adjacent q-pixels c_q^1 and c_q^2, the q-cochain F_q satisfies the relation $F_q(\lambda_1 c_q^1 + \lambda_2 c_q^2) = \lambda_1 F_q(c_q^1) + \lambda_2 F_q(c_q^2)$, where $\lambda 1$ and $\lambda 2$ are integers.

33. An image modelling method as defined in claim 22, wherein:

- relating the quantities to the n-pixels and/or pixel faces through an algebraic structure comprises translating each n-pixel algebraically into a q-pixel, wherein q ∈ {1, 2,..., n}, wherein each q-pixel includes (q-1)-faces, (q-2)-faces, ..., (q-q)-faces;
- producing an image support comprises forming geometrical complexes, each being a collection of q-pixels;
- relating the quantities to the n-pixels and/or pixel faces through an algebraic structure comprises:
    - o expressing each geometrical complex in algebraic form as a q-chain, which is a linear combination of all the q-pixels of the geometrical complex;
    - o forming, in the geometrical complexes, q-cochains which are relations associating quantities related to image features to the q-pixels and/or faces of said q-pixels;
- relating the quantities to each other through algebraic operations comprises:
    - o producing a coboundary operator giving a relationship between the q-cochains; and
    - o producing a codual operation establishing a link between q-cochains that belong to different geometrical complexes.

34. A computational framework for solving a problem using an image computationally modelled by means of the method of claim 33, comprising:

identifying basic laws associated to the problem;

from the identified basic laws, defining quantities related to the problem;

associating the quantities to respective q-cochains;

associating the basic laws related to the problem to respective coboundary and codual operations; and

resolving the resulting algebraic system.

35. A computational framework as defined in claim 34, wherein forming geometrical complexes comprises forming first and second geometrical complexes.

36. A computational framework as defined in claim 35, wherein identifying basic laws associated to the problem comprises supporting one basic law through the first geometrical complex.

37. A computational framework as defined in claim 36, wherein the problem to be solved is a 2D global differential equation for heat flow in a homogeneous medium, and wherein said one basic law is a heat flow law.

38. A computational framework as defined in claim 37, wherein associating the quantities to respective q-cochains comprises representing a global quantity of temperature through a 0-cochain, and associating the heat flow law through a 1-cochain.

39. A computational framework as defined in claim 35, wherein identifying basic laws associated to the problem comprises supporting one basic law through the second geometrical complex.

40. A computational framework as defined in claim 39, wherein the problem to be solved is a 2D global differential equation for heat flow in a homogeneous medium, and wherein said one basic law is a heat source law.

41. A computational framework as defined in claim 36, wherein identifying basic laws associated to the problem comprises supporting a second basic law through the second geometrical complex, and wherein associating the basic laws related to the problem to respective coboundary and codual operations comprises representing a constitutive law linking basic laws from the first and second geometrical complexes by a codual operation.

42. An image modelling method as defined in claim 22, wherein:

- relating the quantities to the n-pixels and/or pixel faces through an algebraic structure comprises translating each n-pixel algebraically into a q-pixel, wherein $q \in \{1, 2, \ldots, n\}$, wherein each q-pixel includes (q-1)-faces, (q-2)-faces, ..., (q-q)-faces;
- producing an image support comprises forming a geometrical complex, which is a collection of q-pixels;
- relating the quantities to the n-pixels and/or pixel faces through an algebraic structure comprises:
    - o expressing the geometrical complex in algebraic form as a q-chain, which is a linear combination of all the q-pixels of the geometrical complex;
    - o forming, in the geometrical complex, q-cochains which are relations associating quantities related to image features to the q-pixels and/or faces of said q-pixels;
- relating the quantities to each other through algebraic operations comprises:
    - o producing coboundary operations giving a relationship between the q-cochains.

43. A computational framework for solving a problem using an image computationally modelled by means of the method of claim 42, comprising:

identifying basic laws associated to the problem;

from the identified basic laws, defining quantities related to the problem;

associating the quantities to respective q-cochains;

associating the basic laws related to the problem to respective coboundary operations; and

resolving the resulting algebraic system.

44. A computational framework for solving a heat transfer problem, comprising:

producing an image support including a structure of n-pixels, the image support comprising:

- q-pixels respectively translating the n-pixel algebraically, wherein $q \in \{1, 2,..., n\}$, and wherein each q-pixel includes (q-1)-faces, (q-2)-faces, ..., (q-q)-faces;
- geometrical complexes each being a collection of q-pixels;
- q-chains respectively expressing the geometrical complexes in algebraic form, each q-chain being a linear combination of all the q-pixels of the geometrical complex;
- in the geometrical complexes, q-cochains which are relations associating quantities related to image features to the q-pixels and/or faces of said q-pixels; and
- a coboundary defining a relation between q-cochains;

computing a q-cochain T of a first of said geometrical complexes as the location of unknown temperatures;

computing a q-cochain H of the first geometrical complex as a global temperature variation;

finding a q-cochain ε of a second geometrical complex as a global energy variation, as a function of the q-cochain H through a linear transformation;

finding the q-cochain ε as a function of the q-cochain T;

defining a q-cochain G of the first geometrical complex from the q-cochain T through a first coboundary operation, transforming the q-cochain G into a q-cochain Q of the second geometrical complex, and defining, from the q-cochain Q and through a second coboundary operation, a q-cochain D of the second geometrical complex as a global diffusion;

defining a q-cochain S of the second geometrical complex as a global source; and

establishing a relation between the q-cochains ε, D and S.

45. A computational framework for two-dimensional active contour model, comprising:

producing an image support including a structure of n-pixels, the image support comprising:

- q-pixels respectively translating the n-pixel algebraically, wherein $q \in \{1, 2, \ldots, n\}$, and wherein each q-pixel includes (q-1)-faces, (q-2)-faces, ..., (q-q)-faces;
- geometrical complexes each being a collection of q-pixels;
- q-chains respectively expressing the geometrical complexes in algebraic form, each q-chain being a linear combination of all the q-pixels of the geometrical complex;
- in the geometrical complexes, q-cochains which are relations associating quantities related to image features to the q-pixels and/or faces of said q-pixels; and
- a coboundary defining a relation between q-cochains;

computing a displacement q-cochain D of a first of said geometrical complexes;

computing a strain q-cochain S of a second of said geometrical complexes, comprising:

- defining an approximate strain function $\tilde{\varepsilon}(x)$ as a function of the q-cochain D;
- expressing the q-cochain S as a function of the approximate strain function and relative positions of the first and second geometrical complexes; and

computing a force q-cochain F of the second geometrical complex as a coboundary of the strain q-cochain S.